

CLAIMS

What is claimed as new and desired to be protected by Letters
Patent of the United States is:

1. A data drive comprising:
 - a drive base;
 - a data transfer mechanism coupled to the drive base;
 - a carriage assembly for receiving a cartridge containing a data storage medium; and
 - a carriage assembly actuator coupled to the drive base for translating the carriage assembly to expose a plurality of radial positions of the data storage medium to the data transfer mechanism.
2. The data drive of claim 1, wherein the data transfer mechanism comprises a holographic data transfer mechanism.
3. The data drive of claim 1, wherein the data transfer mechanism is fixedly coupled to the drive base.
4. The data drive of claim 1, wherein the carriage assembly comprises:
 - a spindle for rotating a hub on a cartridge contained in the carrier, wherein the spindle is translated with the carriage assembly as the carriage assembly is translated by the carriage assembly actuator.

5. The data drive of claim 4, wherein the carriage assembly comprises
- a sled base coupled to the carriage assembly actuator; and
- a carrier for receiving the cartridge, the carrier being configured to move relative to the sled base.
6. The data drive of claim 5, further comprising:
- a carrier loading assembly for translating the carrier from an unload position to a load position, wherein the unload position positions the carrier to receive the cartridge from a load port, and the load position positions the carrier such that the hub on a cartridge within the carrier is mated with the spindle.
7. The data drive of claim 6, wherein the carrier loading assembly is fixedly coupled to the drive base.
8. The data drive of claim 6, wherein the carrier loading assembly translates the carrier from the unload position to the load position by:
- first, translating the carrier in a horizontal direction such that the hub on a cartridge within the carrier is positioned coaxial with the spindle;
- and
- second, translating the carrier in a vertical direction to the load position.
9. The data drive of claim 8, wherein:

the drive base further comprises a carrier guide having at least one guide slot for receiving at least one guide pin provided on the carrier; and

the carrier loading assembly further comprises at least one guide pin driving member for actuating movement of the at least one guide pin along the at least one guide slot.

10. The data drive of claim 9, wherein:

the at least one guide pin driving member comprises a plate rotatable about a driving member axis;

the carrier loading assembly further comprises a load plate movable in a lateral direction from an unload position to a load position, the load plate being configured to cause the at least one guide pin driving member to rotate about the driving member axis when the load plate moves from the unload position to the load position.

11. The data drive of claim 10, further comprising:

a drive door configured to cover the load port in a closed position and to expose the load port in an open position;

wherein the load plate is further configured to move the drive door into the closed position as the load plate moves from the unload position to the load position.

12. The data drive of claim 10, further comprising:

a lock cam for retaining at least one guide pin to prevent the carrier from moving out of the load position.

13. The data drive of claim 5, wherein the carrier further comprises a shutter opener, said shutter opener comprising a lock release for releasing a lock on the cartridge.
14. The data drive of claim 13, wherein the shutter opener comprises:
- a shutter body member rotatable about a shutter opener axis; and
 - a shutter opener boss provided on the shutter body member distal from the shutter opener axis.
15. The data drive of claim 14, wherein the shutter opener boss comprises:
- a shutter opening portion; and
 - a lock release portion configured to contact a lock on the cartridge prior to the shutter opening portion contacting a shutter on the cartridge.
16. The data drive of claim 15, wherein:
- the shutter opener boss is offset from the shutter opener axis such that as a cartridge is inserted into the carrier, the shutter opener rotates about the shutter opener axis, causing the shutter opener boss to travel laterally across a front edge of the cartridge.
17. The data drive of claim 15, wherein:
- the shutter opening portion comprises a first portion of the shutter opener boss having a first width; and

the lock release portion comprises a second portion of the shutter opener boss having a second width larger than the first width.

18. The data drive of claim 1, wherein the carriage assembly further comprises a shutter opener.
19. The data drive of claim 18, wherein the shutter opener is configured to begin opening a shutter on a cartridge after the cartridge has been received a predetermined distance into the carriage assembly
20. The data drive of claim 19, wherein the shutter opener is configured to begin opening a shutter on a cartridge after the shutter has been received in the carriage assembly.
21. The data drive of claim 19, wherein the shutter opener is configured to begin opening a shutter on a cartridge after at least 50% of the cartridge has been received in the carriage assembly.
22. A method of operating a data drive, comprising:
 - receiving a data storage cartridge containing a rotatable data storage medium into a carriage assembly;
 - translating the carriage assembly across a data transfer mechanism;
 - and

reading data from the data storage medium using the data transfer mechanism as the carriage assembly is being translated across the data transfer mechanism.

23. The method of claim 22, further comprising:

maintaining the data transfer mechanism stationary while the data transfer mechanism reads data from the data storage medium as the carriage assembly is translated.

24. The method of claim 22, wherein said data storage medium comprises a holographic medium.

25. The method of claim 22, further comprising:

rotating the rotatable data storage medium using a spindle provided on the carriage assembly, said spindle being translated with the carriage assembly.

26. The method of claim 25, wherein:

said carriage assembly comprises a sled base having the spindle provided thereon and a carrier configured to move relative to the sled base and the spindle; and

said receiving the data storage cartridge into the carriage assembly comprises:

receiving the data storage cartridge into the carrier; and

translating the carrier relative to the sled base and the spindle to mate a hub in the data storage cartridge with the spindle.

27. The method of claim 26, wherein said receiving the data storage cartridge into the carriage assembly comprises:

receiving the data storage cartridge into the carrier; and

translating the carrier relative to the sled base and the spindle to mate a hub in the data storage cartridge with the spindle.

28. The method of claim 27, wherein said translating the carrier relative to the sled base and the spindle to mate the hub with the spindle comprises:

first, translating the carrier in a horizontal direction such that the hub is positioned coaxial with the spindle; and

second, translating the carrier in a vertical direction to a load position in which the hub on the data storage cartridge is mated with the spindle.

29. The method of claim 28, wherein:

said translating the carrier in the horizontal direction comprises utilizing a guide pin driving member to actuate movement of a guide pin on the carrier along a first segment of a guide slot on a carrier guide; and

said translating the carrier in the vertical direction comprises utilizing the guide pin driving member to actuate movement of the guide pin along a second segment of the guide slot on the carrier guide.

30. The method of claim 29, wherein:

said utilizing the guide pin driving member to actuate movement of the guide pin along the first and second segments of the guide slot comprises translating a load plate in a lateral direction from an unload position to a load position, the load plate being configured to cause a guide pin driving member to rotate about a driving member axis when the load plate moves from the unload position to the load position.

31. The method of claim 30, further comprising:

closing a drive door configured to cover a load port in a closed position and to expose the load port in an open position.

32. The method of claim 30, further comprising:

locking the guide pin at an end of the second segment of the guide slot to prevent the carrier from moving out of the load position.

33. The method of claim 26, further comprising opening a shutter on the data storage cartridge.

34. The method of claim 33, further comprising unlocking a shutter lock on the cartridge prior to opening the shutter.

35. The method of claim 34, wherein said unlocking the shutter lock comprises:

unlocking the shutter lock using a shutter opener comprising a shutter body member rotatable about a shutter opener axis and a shutter

opener boss provided on the shutter body member distal from the shutter opener axis.

36. The method of claim 35, wherein:

said unlocking the shutter lock comprises unlocking the shutter lock using a lock release portion; and

said opening the shutter on the data storage cartridge comprises opening the shutter using a shutter opening portion of the shutter opener configured to contact the shutter after the lock release portion unlocks the shutter lock.

37. The method of claim 22, further comprising opening a shutter on the data storage cartridge.

38. The method of claim 37, wherein said shutter is opened after the cartridge has been received a predetermined distance into the carriage assembly.

39. The method of claim 38, wherein said shutter is opened after the shutter has been received into the carriage assembly.

40. The method of claim 38, wherein said shutter is opened after at least 50% of the cartridge has been received in the carriage assembly.

41. A data drive comprising:

a data transfer mechanism;

a carriage assembly for receiving a cartridge containing a data storage medium and having a movable shutter having a shutter lock; and

a shutter opener comprising a lock release for releasing a lock on the cartridge.

42. The data drive of claim 41, wherein the data transfer mechanism comprises a holographic data transfer mechanism.

43. The data drive of claim 41, wherein the shutter opener comprises:

a shutter body member rotatable about a shutter opener axis; and

a shutter opener boss provided on the shutter body member distal from the shutter opener axis.

44. The data drive of claim 43, wherein the shutter opener boss comprises:

a shutter opening portion; and

a lock release portion configured to contact a lock on the cartridge prior to the shutter opening portion contacting a shutter on the cartridge.

45. The data drive of claim 44, wherein:

the shutter opener boss is offset from the shutter opener axis such that as a cartridge is inserted into the carrier, the shutter opener rotates about the shutter opener axis, causing the shutter opener boss to travel laterally across a front edge of the cartridge.

46. The data drive of claim 44, wherein:

the shutter opening portion comprises a first portion of the shutter opener boss having a first width; and

the lock release portion comprises a second portion of the shutter opener boss having a second width larger than the first width.

47. The data drive of claim 41, wherein the shutter opener is configured to begin opening a shutter on a cartridge after the cartridge has been received a predetermined distance into the carriage assembly

48. The data drive of claim 47, wherein the shutter opener is configured to begin opening a shutter on a cartridge after the shutter has been received in the carriage assembly.

49. The data drive of claim 47, wherein the shutter opener is configured to begin opening a shutter on a cartridge after at least 50% of the cartridge has been received in the carriage assembly.

50. A method of operating a data drive, comprising:

receiving into a data drive a data storage cartridge having a movable shutter configured to expose a data storage medium in the data storage cartridge when the shutter is in an open position; and

after the shutter of the data storage cartridge has been completely received into the data drive, moving the shutter into the open position.

51. The method of claim 50, further comprising:
reading data from the data storage medium.
52. The method of claim 50, wherein the data storage medium is
light sensitive.
53. The method of claim 52, wherein the data storage medium
comprises a holographic storage medium.
54. The method of claim 50, further comprising unlocking the
shutter prior to moving the shutter into the open position.